Amendments to the Specification

Please amend paragraph 2 as indicated below.

[0002] This application ~~invention~~ is also related to U.S. Provisional Patent Application No. 60/213,189, filed June 21, 2000, which is incorporated by reference herein. It is also related to U.S. Patent Application Nos. 09/412,560, filed October 5, 1999, and 09/491,461, filed January 26, 2000, both of which are incorporated by reference herein.

Please amend paragraphs 27-34 as indicated below.

[0027] The behavior of model 10 is further described in the graph of FIGS. 2 and 3. These graphs illustrate a behavior that is consistent with the associations shown in FIG. 1~~, where each unit of Product 1 is shown as depending on a unit of Component 1 and a unit of Component 2, and where each unit of Product 2 is shown as depending on a unit of Component 2~~.

[0028] FIG. 2 is a graph 20 of demand showing regions of shortage for components in the model 10. The horizontal axis represents the demand for Product 1, denoted as x_1. The vertical axis represents the demand for Product 2, denoted as x_2. ~~FIG. 2 further indicates the quantities d_1 and d_2, which are the maximum component availabilities of Component 1 and Component 2, respectively.~~

[0029] The graph 20 includes four regions 23, 24, 25, and 26, which are separated by a vertical line 21 and a sloped line 22. The vertical line 21 is shown as separating situations of no component shortages from situations where production is restricted by a shortage of Component 1. ~~represents the situation where the demand for Product 1 is equal to the maximum component availability of Component 1, i.e.: $x_1 = d_1$.~~ The sloped line 22 is shown as separating situations of no component shortages from situations where production is restricted by a shortage of Component 2. ~~represents the situation where the demand for Product 1 plus the demand for Product 2 is equal to the maximum component availability of Component 2, i.e.: $x_1 + x_2 = d_2$.~~

[0030] Region 23 is located to the left of the vertical line 21 and below the sloped line 22. Thus, region 23 has values of the demands x_1 and x_2 that are feasible: in this

region there is enough of Component 1 and of Component 2 to meet the demands for Product 1 and Product 2. ~~This may be seen from the fact that in region 23,~~ $\cancel{x_1 \leq d_1}$ ~~and~~ $\cancel{x_1 + x_2 \leq d_2}$. Thus, in this region 23 the demanded number of units (x_1) of Product 1 does not exceed the amount that can be made from the available supply $\cancel{(d_1)}$ of Component 1, which is needed for Product 1. Also, in this region 23 the demanded number of units of Product 1 combined with the demanded number of units of Product 2 ($x_1 + x_2$) does not exceed the amount that can be made from the available supply $\cancel{(d_2)}$ of Component 2, which is needed both [[booth]] for Product 1 and for Product 2.

[0031] Region 24 is located to the right of the vertical line 21 and below the sloped line 22. Thus, region 24 has values of the demands x_1 and x_2 that would result in a shortage of Component 1: in this region there is enough of Component 2 but not enough of Component 1 to meet the demands for Product 1 and Product 2. ~~This may be seen from the fact that in region 24,~~ $\cancel{x_1 + x_2 \leq d_2}$, ~~but~~ $\cancel{x_1 > d_1}$. ~~Thus, in this region 24 the demanded number of units~~ $\cancel{(x_1)}$ ~~of Product 1 exceeds the available supply~~ $\cancel{(d_1)}$ ~~of Component 1, which is needed for Product 1. The demands in region 24 would thus result in a shortage of Component 1.~~

[0032] Region 25 is located to the left of the vertical line 21 and above the sloped line 22. Thus, region 25 has values of the demands x_1 and x_2 that would result in a shortage of Component 2: in this region there is enough of Component 1 but not enough of Component 2 to meet the demands for Product 1 and Product 2. ~~This may be seen from the fact that in region 25,~~ $\cancel{x_1 \leq d_1}$, ~~but~~ $\cancel{x_1 + x_2 > d_2}$. ~~Thus, in this region 25 the demanded number of units~~ $\cancel{(x_1)}$ ~~of Product 1 can be met by the available supply~~ $\cancel{(d_1)}$ ~~of Component 1, which is the only component needed for Product 1. However, the combined demand~~ $\cancel{(x_1 + x_2)}$ ~~for Products 1 and 2 can not be met by the available supply~~ $\cancel{(d_2)}$ ~~of Component 2, one unit of which is needed for each of Products 1 and 2. The demands in region 25 would thus result in a shortage of Component 2.~~

[0033] Region 26 is located to the right of the vertical line 21 and above the sloped line 22. Thus, region 26 has values of the demands x_1 and x_2 that would result in a shortage of both Component 1 and Component 2: in this region there is not enough of Component 1 and not enough of Component 2 to meet the demands for Product 1 and

Product 2. ~~This may be seen from the fact that in region 26, $x_1 > d_1$ and $x_1 + x_2 > d_2$. Thus, in this region 26 the demanded number of units (x_1) of Product 1 can not be met by the available supply (d_1) of Component 1, which is the only component needed for Product 1. Further, the combined demand ($x_1 + x_2$) for Products 1 and 2 can not be met by the available supply (d_2) of Component 2, one unit of which is needed for each of Products 1 and 2. The demands in region 26 would thus result in a shortage of Component1 and a shortage of Component 2.~~

[0034] Production is feasible if the demands x_1 and x_2 fall in the feasible region 23. In those situations, the demands x_1 and x_2 can be met by the available supply of components ~~d_1 and d_2~~. The feasible region may be denoted by the symbol Ω. In the model 10 depicted in FIGS. 1 and 2, the feasible region Ω is defined by the boundaries <u>provided by the vertical line 21 and the sloped line 22.</u> ~~$x_1 \leq d_1$ and $x_1 + x_2 \leq d_2$.~~ It may be seen that these conditions can be written more generally as:

$$\Omega = \{\underline{\vec{x}\,:}\ \vec{a}_i \bullet \vec{x} \leq d_i \quad \forall i\} \qquad (1).$$

In Eq. 1, vector $\vec{x}$ represents the demand for products. The quantity d_i in Eq. 1 represents the maximum component availability <u>or the maximum expeditable level of</u> [[for]] component *i*. The vector $\vec{a}_i$ are the "connect rates" for component *i*. Connect rates between products and components represent the number of components required for the manufacture of one unit of product. Connect rates may be used to describe the consumption of components for each unit of the various products. <u>The vector $\vec{a}_i$ represents the bill of materials needed to make one unit of product *i*.</u>

Please amend paragraph 36 as indicated below.

[0036] A shortage event occurs if the realized demand $\vec{x}$ is such that $\underline{\vec{a}_i \bullet \vec{x} > d_i .}$ ~~$\vec{a}_i \bullet \vec{x} \leq d_i$. With reference to FIGS. 1 and 2, it may be seen that the connect rates $\vec{a}_i$ represent the relationship between products and components. In the model 10 discussed above, it may be readily seen that the connect rates $\vec{a}_1$ for Component 1 have a value of (1,0), since one unit of Component 1 is used for each unit of Product 1, and zero units of~~

~~Component 1 are used for each unit of Product 2. Similarly, the connect rates $\vec{a}_2$ for Component 2 would have a value of (1,1), since in the model 10 one unit of Component 2 is used for each unit of Product 1, and one unit of Component 2 is used for each unit of Product 2. With these values of $\vec{a}_1$ and $\vec{a}_2$ for the model 10, it may be readily seen that Eq. 1 directly indicates that the feasible region Ω has demand values (x_1 and x_2) for which $x_1 \leq d_1$ and $x_1 + x_2 \leq d_2$. This result from Eq. 1 matches the graphical analysis discussed above for the feasible region 23.~~

Please amend paragraphs 40-42 as indicated below.

[0040] In Eq. 2, it may be seen that x is an integration variable that runs through the non-feasible values of component i: from d_i to infinity. The function $N(x,\mu,\sigma)$ is the normal density distribution of a variable x with mean of μ and a variance of σ^2. ~~The integral in Eq. 2 thus evaluates the probability that a normally-distributed demand will require an amount of component i in excess of the available quantity d_i.~~

[0041] FIG. 3 is a graph of demand showing regions of gating for components from FIG. 1. Again, the horizontal axis represents the demand x_1 for Product 1 and the vertical axis represents the demand x_2 for Product 2. FIG. 3 also includes the vertical line 21 ~~where $x_1 = d_1$,~~ and the sloped line 22 ~~where $x_1 + x_2 = d_2$~~.

[0042] FIG. 3 additionally includes a sloped line 38 that has one end at the intersection of lines 21 and 22, and which divides the combined shortage regions (24, 25, and 26 from FIG. 2) into two new regions 34 and 35. (The sloped line 38 may be defined by a policy vector, shown in bold~~, that represents a production policy for the various products and components~~.) Region 34 is to the left of the sloped line 38. Region 35 is to the right of the sloped line 38.

Please amend paragraph 59 as indicated below.

[0059] In block 46, the gating risk is calculated through an application of Eq. 8 to the mean productions q_i^+ and $\underline{\mathbf{q}_i}^-$ [[q_i^{-x}]] for the increased and decreased component plan. Block 46 evaluates a_i * (q_i^+ + $\underline{\mathbf{q}_i}^-$ [[q_i^{-x}]])/(2 * epsilon), where a_i is the vector of connect rates for component *i*. In block 48 the looping from block 43 ends, and the procedure returns to block 43 to calculate gating risk for the next component (if any). The results of the calculation may be reported to a user in block 49.